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Original Research Article

Nutritional status assessment by anthropometry in children with chronic liver disease aged 6 months to 12 years

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ABSTRACT

Background: In spite of distinctive improvements in nutritional therapy, malnutrition and growth retardation remained as challenging significances of chronic liver disease (CLD) in children. The present study was done to evaluate the severity and frequency of malnutrition using anthropometry in CLD children.
Methods: The study included 50 children with CLD attending the OPD of Institute of Child Health and Hospital for Children, Egmore, Chennai during the period from April 2016 to September 2016. Physical growth and nutritional status in the patients were evaluated using anthropometric parameters and Z-scores.
Results: The incidence of malnutrition in the children using height for age was found to be 90%, weight for age- 84%, BMI for age- 40%, MAC for age- 88%, TST for age- 88%. SGA showed 96% malnutrition. Weight for age and body mass index were influenced by this fluid retention (P=0.002 and P=0.007 respectively). Whereas height for age, MAC and TST were not influenced by fluid retention (P=0.321, P=0.371 and P=0.031 respectively).
Conclusions: Assessment of nutritional status in CLD children can be easily diagnosed by anthropometric measurements. Early diagnosis of malnutrition will decrease the related morbidity and mortality in children.

Keywords: Anthropometry indices, Children, Chronic liver disease, Nutritional status

INTRODUCTION

Liver plays a very important role in maintaining the healthy nutritional status by carrying out many physiological functions in digestion, absorption, metabolism and excretion. In circumstances of chronic liver diseases, all the above functions will be impaired and may result in protein-calorie malnutrition.[1,2] Approximately 60-80% of children chronic liver disease (CLD) has malnourishment. Prevalence rates vary depending on the assessment tool which is used to define malnutrition that was studied. Many studies have reported the prevalence rate as 65-90% and the prevalence of malnutrition increases as the patient's disease progresses.[3] Many factors contribute to malnutrition in patients with CLD. Reduction in food intake begins due to symptoms of anorexia, nausea, dysgeusia, and due to severe restriction of diet with sodium content. Impaired digestion and absorption in CLD patients result in higher metabolic demands with an increase in rest energy expenditure, leading to increased malnutrition if an adequate calorie intake is not supplied.[4,5] Nutritional assessment in CLD patients can be challenging. Subjective Global Assessment (SGA) is a practical tool that combines data from clinical history and physical examination (weight loss, changes in dietary intake, gastrointestinal symptoms, functional capacity, metabolic demands, signs of muscle wasting and the presence of

peripheral oedema).[6] Classic anthropometric parameters such as weight and Body Mass Index (BMI) are often overemphasized by ascites and tissue oedema. Skinfold thickness (bicep, triceps or subscapular) and mid upper arm circumference (MAC) are less influenced by patient fluid status and despite the possibility of inter-observer variability, these measures are considered to be more sensitive than BMI to detect malnutrition in CLD patients.[7,8] The present study was undertaken to assess the severity and frequency of malnutrition using anthropometry in CLD children.

METHODS

The present descriptive study was conducted on total of 50 children with chronic liver disease in both OP and medical wards of ICH and HC who meet the inclusion criteria after getting approval from institutional review board during the period from April 2016 to September 2016. Informed written consent was obtained from the parents of all the study subjects attending the Institute of Child Health and Hospital for Children, Egmore, Chennai.

Inclusion criteria

- All children aged 6 months to 12 years with CLD admitted in medical wards and those who attend the OP of ICH and HC.

Exclusion criteria

- All critically ill patients were excluded from the study.

Complete physical examination was done for all the patients who presented with clinical findings of CLD. Anthropometric nutritional assessment was carried out during the first 24 hours after admission. Clinical examination included assessment of height, weight, body mass index (BMI), mid arm circumference (MAC), triceps skin fold thickness (TST) of the study population. All the measurements were plotted against the curves published by the National Center for Health Statistics (NCHS) and the World Health Organization (WHO) standards to determine the nutritional status of the participants. The standard deviations of scores (z-scores) were used to grade the nutritional status of the children. Z-score below -3 SD is considered as severe malnutrition, -3 to -2 as moderate malnutrition, -2 to 0 as mild malnutrition. Accordingly, overweight children defined as having a z-score weight for stature higher than +2 SD.[9] Length was measured using infantometer for children less than 2 yrs and stadiometer for more than 2 yrs. Weight was measured using electronic digital meter for less than 2 yrs and beam scale for more than 2 yrs. MAC is calculated using measuring tape midway between acromian and olecranon. Subjective global assessment (SGA) is based on the weight change, change in dietary intake, gastro intestinal symptoms, functional capacity, subcutaneous fat, muscle wasting and edema and ascites and will be graded into mild, moderate, severe malnutrition.

Statistical analysis

All the data were entered in the Microsoft Excel spread sheet and analysed using SPSS Software version 20.0. The outcome was expressed as proportion. Chi Square test was used to determine the association between outcome variable and dependent variable. P value less than 0.05 was considered significant.

RESULTS

The study population consisted of 50 children with CLD.

Table 1: Frequency of malnutrition using anthropometry indices (n=50).

Anthropometry indices	Frequency	Percent
Height for age (H/A)		
<-3	18	36.0
-3 to -2	16	32.0
-2 to 0	11	22.0
0 to 2	5	10.0
Weight for age (W/A)		
<-3	11	22.0
-3 to -2	13	26.0
-2 to 0	18	36.0
0 to 2	6	12.0
2 to 3	2	4.0
BMI for age (BMI/A)		
<-3	8	16.0
-3 to -2	3	6.0
-2 to -1	9	18.0
-1 to 0	14	28.0
0 to 1	4	8.0
1 to 2	5	10.0
2 to 3	6	12.0
>3	1	2.0
MAC for age (MAC/A)		
<-3	15	30.0
-3 to -2	21	42.0
-2 to -1	8	16.0
-1 to 0	2	4.0
0 to 1	4	8.0
TST for age (TST/A)		
<-3	18	36.0
-3 to -2	22	44.0
-2 to -1	4	8.0
-1 to 0	3	6.0
0 to 1	3	6.0
SGA		
Severe	16	32.0
Moderate	19	38.0
Mild	13	26.0
Nil	2	4.0

As shown in Table 1, the incidence of malnutrition in the children using height for age was found to be 90% of which 36% had severe malnutrition and 32% had moderate malnutrition and 22% had mild malnutrition. By using weight for age, the incidence is found to be 84% of which 22% had severe, 26% had moderate and 36% had mild malnutrition. By using BMI, 40% had malnutrition of which 16% had severe, 6% had moderate and 18% had mild malnutrition. By using MAC, 88% had malnutrition of which 30% had severe, 42% had moderate and 16% had mild malnutrition. TST showed 88% had malnutrition of which 36% showed severe, 44% showed moderate and 8% showed mild malnutrition. SGA showed 96% malnutrition of which 26% had mild, 38% had moderate and 32% had severe malnutrition.

Table 2: Relationship of an anthropometry measurements with fluid retention.

	Fluid retention		P value
	Absent (N=34)	**Present (N=16)**	
Height for age (H/A)			0.321
<-3	12	6	
-3 to -2	9	7	
-2 to 0	8	3	
0 to 2	5	0	
Weight for age (W/A)			0.002
<-3	11	0	
-3 to -2	10	3	
-2 to 0	6	12	
0 to 2	5	1	
2 to 3	2	0	
BMI for age (BMI/A)			
<-3	8	0	
-3 to -2	0	3	0.007
-2 to -1	5	4	
-1 to 0	9	5	
0 to 1	0	4	
1 to 2	3	2	
2 to 3	6	0	
>3	0	1	
MAC for age (MAC/A)			
<-3	11	4	0.371
-3 to -2	12	9	
-2 to -1	5	3	
-1 to 0	2	0	
0 to 1	4	0	
TST for age (TST/A)			
<-3	14	4	0.031
-3 to -2	10	12	
-2 to -1	4	0	
-1 to 0	3	0	
0 to 1	3	0	

Table 2 presented the comparison of all the above parameters with fluid retention. Of which weight for age and body mass index were influenced by this fluid retention with P value of (P=0.002) and (P=0.007) respectively. Whereas height for age, MAC and TST were not influenced by fluid retention with P value showing (P=0.321), (P=0.371) and (P=0.031) respectively. Fat soluble vitamin deficiency is present in 38% of children.

DISCUSSION

The incidence of CLD in neonates was estimated approximately at the rate of 1 in 2500 live births.[10] Study conducted by Roggero et al found that the age of infants and the degree of hepatic failure are the predominant factors that influence undernutrition in children with chronic liver disease.[11]

Nutritional deficiencies are usually observed prior to clinical signs of hepatic insufficiency. There is no diagnostic gold standard method for assessing the nutritional status in CLD patient as the parameters employed for evaluation were altered by other factors like organomegaly, ascites, and edema.[12] The present study was conducted with the objective to assess the severity and frequency of malnutrition using anthropometry in chronic liver disease children.

In the present study, anthropometry measurements were used to assess the nutritional status in children with CLD. Authors found that 36% severe malnutrition by H/A, 22% by W/A, 16% by BMI/A, 30% by MAC/A, and 36% by TST/A. These findings were in accordance with observations of previous studies and confirm that malnutrition is common in children with CLD.[11,13,14]

Nutritional assessment done by SGA showed 32% of severe malnutrition, 38% of moderate nutrition and 26% of mild malnutrition in study subjects. This was similar to the findings of Nunes et al.[2]

In present study, the anthropometric measurements were compared among them; showing mid arm circumference is a better measurement of malnutrition than body mass index in which the former diagnose more of severe and moderate degree of malnutrition. Between mid-arm circumference and triceps skin fold thickness the later diagnose, 6% more of severe malnutrition and 2% more of moderate degree of malnutrition. Between triceps skinfold thickness and subjective global assessment, the later diagnose 8% more of malnutrition. On total, the anthropometry indices diagnosed 81% of the children with chronic liver disease have some degree of malnutrition.

As per previous findings, conventional anthropometry alone such as weight and stature measurements are not sufficiently reliable for patients with liver disease to assess the nutritional status, especially those who have fluid retention and poor hepatic synthetic function. In present study, W/A and BMI/A were factors significantly influenced by the fluid retention ($p<0.05$). According to Ramaccioni et al, body composition analysis which measures fat, cell mass, extracellular water, and fat-free

extracellular solids are to be preferred for complete assessment of nutritional status as the body fat compartment is not influenced by oedema because of its anhydrous state.[15]

Many studies found that MAC and TST were not influenced by fluid retention.[7,8] An analysis of present study also demonstrated similar finding. H/A, MAC and TST were not influenced by fluid retention with P value showing 0.321, 0.371 and 0.031 respectively.

CONCLUSION

The findings of the study conclude the importance of anthropometric measurement in all CLD children for the early diagnosis of malnutrition. Timely assessment of anthropometry measurements reduces the morbidity and mortality in children of CLD with undernutrition.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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